

REMARKS

Please cancel Claims 2-4, 9 and 13-14 without prejudice. Claims 1, 5-8, 10-12 and 15-19 are pending. Claims 1, 5, 10, 15 and 19 are amended herein. No new matter is added as a result of the claim amendments. Support for the claim amendments can be found at least on page 11, starting at line 25, of the instant application.

103 Rejections

The instant Office Action states that Claims 1, 5-8, 10-12 and 15-19 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakajima et al. ("Nakajima;" U.S. Patent No. 5,428,217) in view of Lewis (U.S. Patent No. 5,650,613). The Applicants have reviewed the cited references and respectfully submit that the embodiments of the present invention recited in Claims 1, 5-8, 10-12 and 15-19 are not anticipated nor rendered obvious by Nakajima and Lewis, alone or in combination.

Claims 1 and 5-8

Independent Claim 1 recites an encoder disk having at least first, second, third and fourth regions "wherein light transmitted through said first and second regions produces a first electrical output, light transmitted through said first and third regions produces a second electrical output, and light transmitted through said second and fourth regions produces a third electrical output, wherein said second and third outputs are reference outputs used to adjust said first output, and wherein said first, second and third outputs are used to determine an angular position of said disk."

Applicants respectfully submit that neither Nakajima nor Lewis, nor the combination thereof, show or suggest this new limitation. For example, Figures 29 and 30 of Nakajima describe a disk that produces three outputs; however, according to Nakajima, one of the outputs is used only to select one or the other of the other two outputs, and none of the outputs are used as reference outputs that adjust the output of a third output. Lewis does not show or suggest multiple outputs.

In summary, Applicants respectfully submit that Nakajima and Lewis, alone or in combination, do not show or suggest the embodiments of the present invention recited in independent Claim 1. Furthermore, because Claims 5-8 depend from Claim 1 and recite additional limitations, Applicants respectfully submit that Nakajima and Lewis, alone or in combination, do not show or suggest the embodiments of the present invention recited in Claims 5-8. Therefore, Applicants respectfully submit that the basis for rejecting Claims 1 and 5-8 under 35 U.S.C. § 103(a) is traversed, and that Claims 1 and 5-8 are in condition for allowance.

Claims 10-12 and 15-19

Independent Claim 10 recites an encoder having a code disk and a detector, wherein the code disk has at least first, second, third and fourth regions and “wherein said detector comprises a first photodiode that straddles said first and second regions, a second photodiode that straddles said first and third regions, and a third photodiode that straddles said second and fourth regions, wherein said outer radius of said third region is dimensioned such that the outputs of said third and second photodiodes are equal at a first angular position to provide a first reference output, wherein said inner radius of said fourth region is dimensioned such that the outputs of said first and second photodiodes are equal at a second

angular position to provide a second reference output, and wherein said first and second reference outputs are used with an output of said first photodiode to determine an angular position of said disk.” Applicants respectfully submit that neither Nakajima nor Lewis, nor the combination thereof, show or suggest this new limitation.

In summary, Applicants respectfully submit that Nakajima and Lewis, alone or in combination, do not show or suggest the embodiments of the present invention recited in independent Claim 10. Furthermore, because Claims 11-12 and 15-19 depend from Claim 10 and recite additional limitations, Applicants respectfully submit that Nakajima and Lewis, alone or in combination, do not show or suggest the embodiments of the present invention recited in Claims 11-12 and 15-19. Therefore, Applicants respectfully submit that the basis for rejecting Claims 10-12 and 15-19 under 35 U.S.C. § 103(a) is traversed, and that Claims 10-12 and 15-19 are in condition for allowance.

Claims 5-8 and 15-18

Applicants respectfully agree with the statement in the instant Office Action that Nakajima does not teach a fifth, sixth or seventh region as recited in Claims 5-8 and 15-18. Lewis also does not show or suggest fifth, sixth and seventh regions.

Applicants respectfully disagree that these claim limitations would have been obvious to one of ordinary skill in the art. The fifth, sixth and seventh regions provide utility and advantages beyond those provided by the claimed first, second, third and fourth regions. Namely, the fifth, sixth and seventh regions provide

robustness against any singularities that might otherwise be present, in particular the singularity at the angular disk position that is both zero and 360 degrees.

Applicants respectfully note that Nakajima in particular suffers from this deficiency. Looking at Figure 21 of Nakajima, for example, both r_1 and r_2 can have two values at the angular position that is both zero and 360 degrees. This error is carried into equations (12) and (13) of Nakajima; these equations quite clearly predict two different values of r_1 and r_2 depending on whether zero degrees or 360 degrees is used for the values of θ_1 and θ_2 .

Thus, the claimed fifth, sixth and seventh regions are not merely obvious improvements that would have been apparent to one of ordinary skill in the art. Applicants respectfully submit that the Examiner has not presented a convincing line of reasoning as to why the claimed subject matter as a whole would have been obvious. The purpose of the claimed fifth, sixth and seventh regions is not “prima facie obvious from the purpose disclosed in the reference,” because the reference fails to address this problem in any respect. Applicants respectfully submit that the Examiner provide a reference or additional basis supporting a conclusion of prima facie obviousness.

In summary, Applicants respectfully submit that the basis for rejecting Claims 5-8 and 15-18 under 35 U.S.C. § 103(a) is traversed, not only because these claims are dependent on allowable base claims, but also because the additional limitations recited in these claims are not shown or suggested by Nakajima and Lewis, alone or in combination.

Conclusions

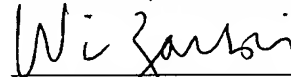
In light of the above remarks, Applicants respectfully request reconsideration of the rejected claims.

Based on the arguments presented above, Applicants respectfully assert that Claims 1, 5-8, 10-12 and 15-19 overcome the rejections of record and, therefore, Applicants respectfully solicit allowance of these claims.

The Examiner is invited to contact Applicants' undersigned representative if the Examiner believes such action would expedite resolution of the present Application.

Respectfully submitted,

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